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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/840,095	05/06/2004	Chao-Lung Chen	N1085-00288	7304

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DUANE MORRIS LLP
IP DEPARTMENT (TSMC)
30 SOUTH 17TH STREET
PHILADELPHIA, PA 19103-4196

EXAMINER

NGUYEN, THANH T

ART UNIT	PAPER NUMBER
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2813

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/05/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No. *12*

10/840,095

Applicant(s)

CHEN ET AL.

Examiner

Thanh T. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 January 2007.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-19 and 21-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1,2,4-17 and 21-23 is/are allowed.
- 6) ☒ Claim(s) 18 and 19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Request for Continued Examination

The request filed on 1/13/07 for a Request for Continued Examination (RCE) under 37 CFR 1.114 is acceptable and an RCE has been established. An action on the RCE follows.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:3

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 18 is rejected under 35 U.S.C. 102(b) as being anticipated by Simpson et al. (U.S. Patent No. 6,297,155).

Depositing a seed layer (116) on a surface of the wafer;
electroplating the metal layer (see figures 3-7, see abstract, col. 5, lines 53-60) on the wafer (102) by:

first immersing the wafer in a first electrolytic solution containing metal ions and first biasing the wafer negatively (noted that plating wafer must always put on negative side so that positive metal ions can be attracted to the wafer and therefore deposit on the wafer) with respect to the first electrolytic solution so as to create a first current flow and a first current density

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(252), the first immersing being the initial step in the electroplating (see figures 3, 9, col. 13, lines 22-39);

then immersing the wafer in a second electrolytic solution that contains metal ions and secondly biasing the wafer negatively (noted that plating wafer must always put on negative side so that positive metal ions can be attracted to the wafer and therefore deposit on the wafer) with respect to the second electrolytic solution so as to create a second current flow and a second current density (254), the second current density (254) being greater than zero and less than the first current density (252, see figures 5, 9, col. 13, lines 40-55); and

then immersing the wafer in a third electrolytic solution that contains metal ions and thirdly biasing the wafer negatively (noted that plating wafer must always put on negative side so that positive metal ions can be attracted to the wafer and therefore deposit on the wafer) with respect to the third electrolytic solution so as to create a third current flow and a third current density (256), the third current density (256) being greater than the first current density (252, see figure 9, col. 13, lines 56-67).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Simpson et al. (U.S. Patent No. 6,297,155) as applied to claim 18 above in view of a person of ordinary skill in the art.

Simpson et al. teach electroplating the metal in the via at different current densities in the plasma chamber.

However, the reference does not teach the second electrolytic solution take place for 1-30 seconds and the current density being no greater than 0.0016 amps/cm².

Nevertheless, the specification contains no disclosure of the critical nature of the second current density and the time or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the applicant must show that the chosen limitations are critical. In re Woodruff, 919 F.2d 1575, 1578 (Fed. Cir. 1990).

It would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made to optimize the second current density and the time, since it has been held that where the general conditions of a claim are disclosed in the prior art (i.e.-electroplating the copper, see figure 5), discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233 (CCPA 1955).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form a copper layer with teach the second electrolytic solution take place for 1-30 seconds and the current density being no greater than 0.0016 amps/cm² in process of Simpson et al. because choosing an optimum range of current densities, time to form a desire copper film for interconnect.

Allowable Subject Matter


Claims 1-2, 4-17, 21-23 are allowed because none of the prior art alone or in combination teaches or suggests the particular subset of the process steps in forming electroplating a metal film onto a wafer by a continuous electrochemical deposition, and the first step being the initial step in the continuous electrochemical deposition..

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on (571) 272-1702. The fax phone number for this Group is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://paired.uspto.gov>. Should you have questions on access to thy Private PAIR system, contact the Electronic Business center (EBC) at 866-217-9197 (toll-free).


Thanh Nguyen
Patent Examiner
Patent Examining Group 2800

TTN